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	First Named Inventor	Corrigan, Thomas R.
	Art Unit	3651
	Examiner Name	Joseph E. Valenza
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Date: October 26, 2004	Attorney for Applicant: Rick L. Franzen	

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☐ Amendment/Reply ☐ After Final ☐ Affidavits/Declaration(s)	☐ Petition to Convert a Provisional Application	☐ Appeal Communication to Technology Center (Appeal Notice, Brief, Reply Brief)
☒ **Extension of Time Request**	☐ Power of Attorney, Revocation	☐ Proprietary Information
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☐ Response to Missing Parts/ Incomplete Application ☐ Response to Missing Parts under 37 CFR § 1.52 or 1.53	☐ Request for Refund	
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First Named Inventor:	CORRIGAN, THOMAS R.		
Application No.:	09/905095	Group Art Unit:	3651
Filed:	July 13, 2001	Examiner:	Joseph E. Valenza
Title:	CONTINUOUS MOTION ROBOTIC MANIPULATOR		

BRIEF ON APPEAL

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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October 26, 2004
Date

Kathleen M. Sandvig
Signed by: Kathleen M. Sandvig

Dear Sir:

This Brief is presented in support of the Appeal mailed on May 26, 2004, from the final rejection of Claims 1-3, 8, 9, 18-22, 27, 28, 34, and 51 of the above-identified application, as set forth in the Final Office Action mailed January 22, 2004. The fees required under 37 CFR § 41.20(b)(2) in the amount of $340 for the appeal and any other charges currently due should be charged to, or credit any overpayment, to Deposit Account No. 13-3723.

I. REAL PARTY IN INTEREST

The real party in interest is 3M Company (formerly known as Minnesota Mining and Manufacturing Company) of St. Paul, Minnesota and its affiliate 3M Innovative Properties Company of St. Paul, Minnesota.

II. Related Appeals And Interferences

Appellants are unaware of any related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-3, 8, 9, 18-22, 27, 28, 34, and 51 are pending, and are the subject of this Appeal (Appendix 1, Claims). Claims 40-49 have been cancelled. Claims 4-7, 10-17, 23-26, 29-33, 35-39, and 50 have been withdrawn from consideration.

IV. Status Of Amendments

Subsequent to the mailing of the Final Office Action on January 22, 2004, a response under 37 C.F.R. §1.116 was filed on March 22, 2004, but none of the pending claims were amended therein.

V. Summary Of The Claimed Subject Matter

The presently claimed subject matter relates to a continuous motion robotic device having at least three robotic arms (such as arms 202 in FIG. 5B). Page 15, lines 7-9. Each of the arms is arranged, and rotates, about a central axis (such as primary joint 212 in FIG. 5B). Page 14, lines 1-3. The central axis is defined by a drive system (such as drive system 205 in FIG. 5B) that commonly controls the robotic arms. Page 14, line 1 – Page 15, line 15. Further, each of the robotic arms is decoupled from one another, meaning that, at a point in time, at least a portion of two of the arms may pass through different angles relative to the central axis. Page 13, line 23 – page 15, line 3. Each robotic arm is free to rotate a full 360°. Additionally, each robotic arm includes an end effector (such as end effector 211 in FIG. 5B) for performing work on an object. Page 13, lines 28-30.

This summary does not provide an exhaustive or exclusive view of the present subject matter, and Appellant refers to the appended claims and their legal equivalents for a complete statement of the invention.

VI GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Issue 1:

Whether claims 1-3, 8, 9, 18-22, 27, 28, 34, and 51 have been erroneously rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,647,784 to *Stephens* in view of U.S. Patent No. 4,636,137 to *Lemelson*, U.S Patent No. 4,664,590 to *Maekawa*, and/or U.S. Patent No. 6,393,335 to *Ostwald*.

VII. ARGUMENTS OF APPELLANTS

A. The Law Applicable Under 35 U.S.C. §103

MPEP §2142 states the basic applicable law governing obviousness of claimed subject matter:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

B. Rejection of Claims 1, 2, 3, 8, 9, 18-22, 27, 28, 34, and 51

Applicant's claimed invention relates to a continuous motion robotic device for processing objects. The device is described in claim 1, below:

> 1. A continuous motion robotic device for processing objects, the device comprising:
> a first robotic arm;
> a second robotic arm;
> a third robotic arm;
> wherein the robotic arms are decoupled and each configured to rotate a full 360° and each include an end effector for performing work on an object, and further wherein the robotic arms are arranged about a central axis relative to one another, and further wherein at least a portion of two of the arms may pass through different angles, relative to the central axis, at the same point in time; and
> a drive system commonly controlling the robotic arms, the drive system defining a central axis about which the robotic arms rotate.

Presently, independent claim 1 and dependent claims 2, 3, 8, 9, 18-22, 27, 28, 34, and 51 stand finally rejected under 35 U.S.C. §103(a). To formulate the rejections of these claims, four references were combined: U.S. Patent No. 4,647,784 to *Stephens*, U.S. Patent No. 4,636,137 to *Lemelson*, U.S Patent No. 4,664,590 to *Maekawa*, and U.S. Patent No. 6,393,335 to *Ostwald*.

As discussed below, none of the four references discloses a drive system that commonly controls the robotic arms. Thus, no conceivable combination of the four references results in the claimed invention. For at least this reason, rejection of these claims under 35 U.S.C. §103(a) is improper. Additionally, there exists no motivation to combine the four references. This deficiency serves as an independent basis on which to overturn the present rejections.

1. None of the Cited Prior Art Discloses a Drive System Commonly Controlling the Robotic Arms

Independent claim 1 includes a limitation requiring a "drive system commonly controlling the robotic arms." The use of a drive system to commonly control a plurality of robotic arms ensures that the end effectors on each arm travel a consistent path. In certain settings, it is desirable for each of a plurality of end effectors to consistently travel the same path. For example, in an assembly line setting, it is important that each end effector consistently travels to a particular position, in order to meet a workpiece, and to operate thereupon. Generally, it is desirable to commonly control a plurality of robotic arms, if each of the arms is to perform the same task. Applicant's specification describes commonly controlled robotic arms as traveling consistent, substantially identical paths:

> Further, by commonly controlling the three robotic arms with the drive system, the robotic arms are optimally sized while affording <u>consistent, controlled paths for each of the end effectors</u>.

page 3, lines 7-9 (emphasis added).

> With this configuration [i.e., commonly driven arms], <u>each of the end effectors 62 traces substantially the same path</u> (designated as "P" in FIG. 1B), but the arms do not do the same thing at the same time.

page 8, lines 10-13 (emphasis added).

In sum, commonly controlled robotic arms exhibit the characteristic that their respective end effectors trace substantially the same path. If the end effectors of a given robotic system do not trace substantially the same path, the arms are not commonly driven.

A simple review of the drawings of the cited prior art reveals that none of those references actually shows a robotic device having three arms, as required by the claims. To formulate his rejection, the Examiner states that a robot, as a whole, can be thought of as being a robotic arm. See Final Rejection, mailed 1/22/04, page 2. Proceeding from this premise, the

Examiner goes on to reason that a system having at least three robots can be said to have three robotic arms. Applicants reject this premise. However, even granting this premise for the sake of argument, the cited prior art does not support a rejection under 35 U.S.C. §103. The claims require a drive system "commonly controlling" at least three robotic arms. Assuming that a robot can be properly portrayed as a robotic arm, then the claims require a drive system commonly controlling at least three robots. For a rejection under 35 U.S.C. §103 to be proper, at least one cited prior art reference would have to describe a system in which at least three robots are commonly controlled. In fact, none of the cited prior art describes such a system.

With respect to *Lemelson* and *Maekawa*, the Examiner admits that the robots disclosed therein are independently, rather than commonly controlled:

> With regard to claim 18, <u>since the robots are independently controlled</u>, the radially adjustable third links of Lemelson or Maekawa could naturally position the end effectors at different radial distances.

Final Office Action, mailed 1/22/04, p. 3 (emphasis added).

With regard to *Stephens*, a simple review thereof reveals that the robots disclosed therein navigate entirely independently of one another, and do not trace the same paths. In fact, the specification states that each robot can be "allocated a particular destination." *Stephens*, col. 2, line 48. This plainly means that each robot may travel along its own path—a characteristic squarely at odds with the notion that the robots are commonly controlled by a drive system.

With regard to *Ostwald*, the end effectors of the various robotic mechanisms disclosed therein do not trace the same path. Again, this means they are not commonly controlled. In *Ostwald*, robotic mechanisms are used to cooperate in placing a desired cartridge into a cartridge player. For example, a first robotic mechanism may be used to remove cartridge #1 from a cartridge player and to return it to storage cell #1. Meanwhile, a second robotic mechanism is used to remove cartridge #2 from storage cell #2 and to place it into the cartridge player. Thus, the end effectors of the first and second mechanisms take different paths—one takes a path in which it extends in an out of storage cell #1, while another takes a path in which it extends in and out of storage cell #2. The fact that the end effectors of the various robotic mechanisms of *Ostwald* travel different paths demonstrates that they are not controlled by a common drive system.

Because *Stephens*, *Lemelson*, *Maekawa*, and *Ostwald* each fail to disclose a robotic device having at least three arms commonly controlled by a drive system, no combination of these references can result in the claimed invention. Further, none of these references suggests such a modification, since such a modification would render each of the robot systems unsuitable for their intended purpose. For at least these reasons, the claimed invention is not rendered obvious in view of *Stephens*, *Lemelson*, *Maekawa*, and *Ostwald*.

2. **There Is No Motivation To Combine *Ostwald* With Any Of The Other Cited Art**

Applicant respectfully points out that claim 1 requires the robotic arms to be "arranged about a central axis," and to "rotate" about that axis. These limitations are noteworthy, because *Ostwald* is the only reference that even arguably discloses a central axis about which robotic arms are arranged and rotate. Therefore, it is crucial that there exist a proper motivation for combining *Ostwald* with the other prior art references. The Examiner has failed to state the motivation for such a combination. The Office action merely concludes, without the provision of any rationale, that it would have been obvious to modify *Stephens* to include the circular track of *Ostwald*:

> However, Ostwald teaches that plural robots 12 can independently travel along circular tracks 22. It would have been obvious to add this teaching to the above structure.

Final Office Action, mailed 1/22/04, p. 2.

Applicant respectfully points out that the main thrust of *Stephens* is the disclosure of a system in which robots move freely within a perimeter, can triangulate their own position, and can move to any position within the perimeter:

> In the present case, the vehicles are of free ranging nature and the invention seeks to provide a system in which the vehicles can be guided over paths <u>which are not of a predetermined nature</u> but with a very high degree of positional accuracy.
>
> * * *
>
> Thus each vehicle is able to determine the precise direction of at least two reflector boards relative to its own position, and using triangulation techniques the vehicle is therefore able to determine its own position relative to <u>any location</u> within the perimeter 1, such as the storage area 5, the work position 6, and the holding area 7.

Stephens, col. 1, lines 10-14, and col. 2, lines 62-68 (emphasis added).

The very purpose of *Stephens* is to provide a means for triangulating the position of robots, so that they may move anywhere within a perimeter, as opposed to moving along paths "of a predetermined nature." Modifying *Stephens* to cause each of the robots to rotate about a central axis would frustrate that purpose—the robots would be no longer free to move anywhere within the perimeter, instead they would travel along a path "of a fixed nature," rotating about a central axis. If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. MPEP §2143.01. Because modifying *Stephens* to include the central axis of *Ostwald* renders the system of *Stephens* unsatisfactory for its purpose, there is no motivation to combine the systems.

For similar reasons, there is no motivation to combine *Ostwald* with either *Lemelson* or *Maekawa*. For example, *Lemelson* discloses an article manipulation and transfer apparatus, which is able to move workpieces about a manufacturing environment. The *Lemelson* robot/manipulator has its own self-contained means of propulsion, so that it can accommodate scenarios in which machines within the manufacturing environment move, or in which various machines may have to be serviced in random order:

> [Prior art control systems] cannot be applied to operations wherein conditions may vary from time to time such as situations where the size and shape of the work or article being handled may vary from time to time, or <u>the machine, conveyor or temporary storage device for the article being handled may move</u> or the manipulator may have to shift and/or vary its operation from time to time. Also, in situations where <u>it may be desired to have one manipulator service a number of machines in no particular timed sequence</u>, the aforementioned conventional means for controlling the manipulator may not suffice to permit proper operation of the manipulator.
>
> * * *
>
> Another object is to provide a control system for remotely and automatically controlling a plurality of article manipulation devices to perform a variety of handling functions which may vary from time to time <u>wherein the control cycle of one or more manipulators in the system may vary with time</u>.
>
> * * *
>
> Another object is to provide a system and method for controlling a machine to perform one or more preprogrammed operations with respect to work <u>wherein the relative position of the work and the machine may vary from time to time</u> and wherein means are provided to account for such variation between the location of the machine and the work.

Lemelson, col. 1, lines 42-54; col. 2, lines 3-8; and col. 2, lines 14-21 (emphasis added).

Modifying *Lemelson* so that the manipulator disclosed therein rotated about a central axis would frustrate the goal of providing a device that could service machines in no particular order, or service manufacturing environments in which machines or workpieces changed locations. Therefore, it is not obvious to combine *Lemelson* with *Ostwald*.

Turning to *Maekawa*, therein is disclosed a transportable robot system, in which a transporter is used to move a robot from machine to machine within a manufacturing environment. An important goal of the *Maekawa* system is to accommodate manufacturing environments in which the layout of the machinery therein is irregular:

> Actually, however, all the machines are rarely arranged in a row in various factories such as machine factories and the like. <u>In most cases, the machines are arranged dispersedly</u> in terms of design of machining steps or of constraint of site condition or the like, and it is impossible to move the robot between a number of machines merely by the traverse function of the robot.

Maekawa, col. 1, lines 24-31 (emphasis added).

Modifying *Maekawa* to include a central axis about which the transporters rotate is inimical to the goal of accommodating manufacturing environments in which the machines are "arranged dispersedly." Therefore, it is not obvious to combine *Maekawa* with *Ostwald*.

Because there is no motivation to combine *Ostwald* with any of the other cited prior art, there is no motivation to arrive at any combination having robotic arms that rotate about a central axis, as required by the claims. Therefore, the rejection of claims 1-3, 8, 9, 18-22, 27, 28, 34, and 51 should be overturned, and the claims should proceed to issue.

SUMMARY

For the foregoing reasons, it is submitted that the Examiner's rejections of the claims were erroneous. Therefore, reversal of his rejections and allowance of all the pending claims are respectfully requested.

Respectfully submitted,

October 26, 2004
Date

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Claims Appendix

1. (Previously presented) A continuous motion robotic device for processing objects, the device comprising:

a first robotic arm;

a second robotic arm;

a third robotic arm;

wherein the robotic arms are decoupled and each configured to rotate a full 360° and each include an end effector for performing work on an object, and further wherein the robotic arms are arranged about a central axis relative to one another, and further wherein at least a portion of two of the arms may pass through different angles, relative to the central axis, at the same point in time; and

a drive system commonly controlling the robotic arms, the drive system defining a central axis about which the robotic arms rotate.

2. (Original) The device of claim 1, wherein the robotic arms are identical.

3. (Original) The device of claim 1, wherein each of the robotic arms includes a first, second and third primary link.

4. (Withdrawn) The device of claim 3, wherein the drive system includes a first input driving each of the first primary links, a second input commonly driving each of the second primary links, and a third input commonly driving each of the third primary links.

5. (Withdrawn) The device of claim 4, wherein at least one of the first, second and third inputs includes a servo-motor.

6. (Withdrawn) The device of claim 4, wherein at least one of the first, second and third inputs includes a cam.

7. (Withdrawn) The device of claim 6, wherein the cam is a barrel cam.

8. (Original) The device of claim 1, wherein each of the robotic arms includes a first primary link, a second primary link, a first primary joint connecting the first primary link to the drive system, and a second primary joint connecting the first and second primary links.

9. (Original) The device of claim 8, wherein the second primary joints are rotary joints.

10. (Withdrawn) The device of claim 8, wherein the second primary joints are sliding joints.

11. (Withdrawn) The device of claim 8, wherein the first primary joints are coupled to one another and the second primary joints are coupled to one another by the drive system such that upon activation of the drive system, the robotic arms are directed through substantially identical paths and the end effectors are positioned at a substantially identical radial distance relative to the center point at any point in time.

12. (Withdrawn) The device of claim 11, wherein the robotic arms each further include a third primary link connected to the second primary link by a third primary joint, each of the third primary joints being coupled to one another by the drive system.

13. (Withdrawn) The device of claim 12, wherein the drive system includes:

a first input including a first central shaft and a first hub, the first primary links being rigidly affixed to the first hub such that the first hub defines the first primary joints and rotation of the first hub commonly rotates the first primary links;

a second input including a second central shaft and a second hub, the second primary joints being commonly coupled by the second hub such that rotation of the second hub commonly rotates the second primary links about the second primary joints, respectively; and

a third input including a third central shaft and a third hub, the third primary joints being commonly coupled by the third hub such that rotation of the third

hub commonly rotates the third primary links about the third primary joints, respectively.

14. (Withdrawn) The device of claim 13, wherein the third input further includes a plurality of secondary connectors, respective ones of which couple respective ones of the third primary joints and the third hub, the secondary connectors being commonly driven by the third hub.

15. (Withdrawn) The device of claim 14, wherein at least one of the secondary connectors is a pulley belt.

16. (Withdrawn) The device of claim 13, further including a secondary link connecting the second hub to the second primary link.

17. (Withdrawn) The device of claim 13, further comprising a secondary link connecting the third hub to the third primary link.

18. (Original) The device of claim 8, wherein the first primary joints and the second primary joints move independent of one another such that upon activation of the drive system, the robotic arms are directed through substantially identical paths and the end effectors are positioned at a different radial distance relative to the centerpoint during at least one point in time.

19. (Original) The device of claim 18, wherein the drive system includes:

a closed loop track having an instant center at any point in time that defines the center point; and

a plurality of first carts separately and moveably coupled to the track, respective ones of which define respective ones of the first primary links, the instant center point of the track defining the first primary joint.

20. (Original) The device of claim 19, wherein each of the robotic arms further includes a third primary link connected to the second primary link by a third primary joint.

21. (Original) The device of claim 19, wherein the drive system further includes a plurality of second joint servo-motors, respective ones of which are connected to and drive respective ones of the second primary joints.

22. (Original) The device of claim 21, wherein each of the robotic arms further includes a third primary link connected to the second primary link by a third primary joint, and further wherein the drive system further includes a plurality of third joint servo-motors, respective ones of which are connected to and drive respective ones of the third primary joints.

23. (Withdrawn) The device of claim 19, wherein the drive system further includes:
a plurality of second carts separately and moveably mounted to the track, respective ones of which are connected to respective ones of the second primary joints.

24. (Withdrawn) The device of claim 23, wherein the drive system further includes:
a plurality of coupler links connecting respective ones of the plurality of second carts to respective ones of the second primary joints.

25. (Withdrawn) The device of claim 23, wherein each of the robotic arms each include a third primary link connected to the second primary link by a third primary joint, the drive system further comprising:
a plurality of third carts separately and moveably coupled to the track, respective ones of which are connected to respective ones of the third primary joints.

26. (Withdrawn) The device of claim 25, wherein the drive system further includes:
a plurality of coupler links connecting respective ones of the plurality of third carts to respective ones of the third primary joints.